



# ANTICIPATORY SHIPPING: AN OVERVIEW ON IMPLEMENTATION OF ANTICIPATORY SHIPPING THROUGH A MANAGERIAL PERSPECTIVE

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## ABSTRACT

*Anticipatory shipping is a logistics practice that involves sending goods to a location before they are actually needed. The goal of anticipatory shipping is to reduce lead times, improve supply chain efficiency, and increase customer satisfaction.*

*There has been a significant amount of research on anticipatory shipping from a management perspective. One study found that anticipatory shipping can lead to cost savings for firms, as it allows them to take advantage of bulk shipping rates and reduce the need for expedited shipping. Another study found that anticipatory shipping can improve customer satisfaction, as it allows firms to deliver goods faster and more reliably.*

*However, anticipatory shipping also has some challenges that need to be considered. For example, firms need to accurately forecast demand and have sufficient storage capacity to hold the anticipatory shipped goods. In addition, anticipatory shipping can lead to increased inventory carrying costs, as firms need to hold onto goods for longer periods of time.*

*Overall, anticipatory shipping has the potential to bring significant benefits to firms, but it requires careful planning and management to be successful. This research paper focuses on identifying the key factors for anticipatory shipping, challenges in implementing and advantages from a managerial perspective.*

## INTRODUCTION

Anticipatory shipping is a strategy used by retailers to improve the efficiency of their supply chain and reduce delivery times by sending goods to locations where they are likely to be needed in the future. This can involve shipping goods to warehouses or distribution centers located near areas where there is expected to be high demand, or even directly to customers' homes if the retailer has a good prediction of what they will want to purchase. Retailers may estimate future consumer demand by looking at data on prior purchases and applying machine learning algorithms to predict what products customers will want to buy. Additionally, retailers can use this information to streamline inventory control and lower the likelihood of supply shortages. By guaranteeing that products are available when customers need them and minimising delivery delays, anticipatory shipping can help companies increase customer satisfaction overall. By improving the effectiveness of their supply chain and obviating the need for last-mile delivery, it can also assist merchants in lowering their expenses.

Many online merchants let clients choose to have their orders delivered to a nearby pickup location. Particularly, in-store pickup services are growing in popularity.

Customers can use this service to benefit from online shopping's conveniences, such as quick price comparison and fast search, without having to pay the shipping costs usually associated with receiving their purchases at their homes.



Moreover, since the items have already been chosen and packaged by store workers for pickup, in-store pickup is less troublesome than traditional shopping.

At the same time, online buyers demand lead times that are getting shorter, such as pickup or delivery in a few hours. Because it combines the benefits of internet convenience with the promptness of a physical store, quick, same-day service is appealing. A number of top online merchants now provide same-day pickup as a less expensive option to home delivery.

Stocking a portion of its inventory at the pickup location in anticipation of future customer demand is one strategy for the retailer to improve the effectiveness of the fulfillment operations. An "anticipatory shipment" technique that Amazon patented tries to anticipate when a consumer will order a product and expedite the shipping process prior to the client placing the order. Shipments with incomplete addresses are used to get goods to distribution centers close by. The package can be sent to the customer's address much more rapidly once the order is received.

One retailer that has used anticipatory shipment as a key component of its supply chain strategy is Amazon. The business has created sophisticated machine learning algorithms that examine data on client purchases, shipping habits, and other aspects to forecast future product demand. Based on these forecasts, Amazon can send items to places where they are likely to be needed, such distribution centers or customers' houses, before the actual order is placed. Amazon has been able to shorten delivery times and increase the availability of goods for its customers by adopting anticipatory shipment. This has contributed significantly to the company's success and established Amazon as a leader in the e-commerce sector. Additionally, anticipatory shipping has reduced Amazon's expenses by improving the efficiency of its supply chain and obviating the requirement for last-mile delivery.

The importance of big data analytics has also been highlighted in the context of e-commerce, as big data allows online merchants to track each user's behaviour, opening up options for businesses like real-time customer care, dynamic pricing, or tailored marketing campaigns. While the gap between the moment of purchase and the arrival of the product used to be the main drawback of e-commerce companies in comparison to brick and mortar stores, last-mile solutions, including same-day or two-hour delivery, allow for almost instant gratification for customers. Products must be kept close to the consumer in order to offer practically rapid delivery services. This is particularly difficult because there are so many different e-commerce players, like Amazon or Alibaba. While many online merchants have started sending merchandise ahead of schedule to ensure quick delivery in order to transport products closer to customers before they complete an online buy, Amazon has started employing BDA to predict their purchasing behaviour. This strategy, known as "anticipatory delivery," was patented by Amazon.

## **LITERATURE REVIEW**

Amazon received a U.S. patent on a method and system for anticipatory package shipping on December 24, 2013. The patent includes methods for shipping goods based on the estimated chance of (possible) customers ordering products from Amazon. Anticipatory shipping involves sending packages ahead of time, before a client has actually placed an order for the items within. Thus, historical trends in customers' tracked interactions with the e-commerce platform, including transactions and click-rates, are used to calculate the forecast of a (possible) purchase. As a result, the patent proposes that the process of shipping a box will instead be started by an algorithm that forecasts future wants of customers in various places rather than by a client clicking the "purchase" button. Delivery times can be further shortened by using predictive analytics for transporting goods, giving this method a significant competitive edge.

Predicting users' preferences has received increasing attention and has been studied over the past decades. This prediction is based on a number of factors like total number of search results, page dwell time (how much time spent on viewing an item page), time spent on whole search session, user type (whether the user is registered or not), device used by the user, the local hour of the day of accessing the website according to author Xi Niu, Chuqin Li and Xing Yu. The Random Forest Method's high accuracy rate of 0.7008 supports the idea that building a tree-based machine-learning model employing consumer behavioral characteristics can accurately predict customers' purchasing behavior. The strongest correlations with the ultimate purchasing decisions are found to be with page dwell time. When a visitor spends roughly 50 seconds on the item page, the likelihood that they will make a purchase is at its highest. This might be used as an actual instruction on where to put information on an item page. Customers who have registered have greater purchase rates. The "three click rule," which states that a user of a website should be able to find any content with no more than three mouse clicks, is another thing to take into account.[3]



Using predictive analytics to deliver the goods can reduce delivery times even more, providing this strategy a considerable competitive advantage. Stocking a portion of its inventory at the pickup location in anticipation of future customer demand is one strategy for the retailer to improve the effectiveness of the fulfillment operations using anticipatory shipping[4].

Some other factors to be considered for effective anticipatory shipping are Number of Orders returned, Expiry date of the product, Inventory costs at the cost of faster-moving items, Extra variants for greater acceptability[5]. Threshold limit needs to be factored in while considering the factors that might predict the customer purchase. The challenge to be addressed would be how many items we could send at once to increase acceptability while minimising loss for the online retailer because for every accepted item, the remainder of the items would need to be returned, which would cost the business one-fourth of the delivery fee that was incurred to send the product.[5] However, further research could be carried out for building a model that can easily incorporate changing demand characteristics between periods. Another direction for future study could be incorporation of multi-order items in single order which will require a more complicated predictive analytics algorithm and the analysis of demand dependency. Two-dimensional packing system, multiple pickup points, limited stock at central warehouse, consolidated routing for different locations and transshipment could be incorporated in building models for anticipatory shipping[6]. The scope of this topic further extends in understanding what is the size and quantity of order a customer will purchase which can be considered as an additional input for an anticipatory shipping algorithm. There are other factors which can contribute for purchase prediction: data related to pricing, marketing campaigns, fashion trends.[7]

According to this research anticipatory shipment can offer significant advantages over on-demand transportation systems that frequently send out small packages[4]. The benefits of anticipatory shipping increases with increase in distance to the pickup point and shorter customer lead time. Ultimately this strategy helps achieve lower cost and increased service level.

### **BIG DATA ANALYTICS IN SUPPLY CHAIN MANAGEMENT**

Data analytics are categorised into descriptive, predictive, and prescriptive analytics according to a commonly used BDA taxonomy. Predictive analytics produces forecasts about future events, descriptive analytics provides insights into past events, and prescriptive analytics provides recommendations for future actions to aid in decision-making. Due to its broad range of applications, BDA is currently a hotly debated topic among academics. Despite the fact that all three forms of BDA have applications across the board in SCM, there are still many unexplored areas in its use. Manufacturing or logistics are the subjects of the majority of studies on BDA in SCM. Using radio-frequency identification (RFID) tags or mobile devices, big data gathered from participants in the distribution network, such as carriers and logistics service providers, can be used in logistics to improve the efficiency of transportation networks. Applications of BDA in the manufacturing industry include production, quality assurance, maintenance, and energy management, among others. Demand forecasting is one of the key uses of BDA in demand management. Utilization of social media data to increase online store demand forecast accuracy. Demand shaping is a second, rising-in-importance subject in demand management that uses BDA. Companies may now predict consumer demand as more data about specific customers becomes available. This enables them to provide individualized promotions or discounts and ultimately affect consumer demand. BDA can be used in procurement to control sourcing risk, supplier performance, and supplier selection.

### **STUDY ON CUSTOMER BEHAVIOR FOR ANTICIPATORY SHIPPING**

Customer behavior in e-commerce is the subject of one particular area of research. The issue of BDA comes in combining the two forms of data, which are normally dealt with by e-commerce businesses as structured (e.g., consumer age, gender) and unstructured (e.g., clicks, likes, tweets). The detection of client demands, market segmentation, or making pertinent information available at the appropriate moment are typical BDA applications in e-commerce. The latter is exemplified by Amazon's recommendation system, which suggests goods to customers in accordance with their tastes. Unstructured data, like clickstream data, is frequently used in marketing and demand forecasting, for example, to provide customised services, to redirect visits with a high purchase probability to a server that performs better in order to forecast purchase probabilities for a specific site visit. A key predictor of online purchases is client browsing behaviour, according to Bayesian algorithms used to forecast task completion in the online purchase process.



As the user's day of purchase draws near, forecast whether they will make a purchase or not. to leverage information from a variety of sources, including clickstream data, customer demographics, and previous purchase behaviour, in their forecast of consumer purchase probabilities. They specifically forecast if a buyer will make a purchase during their subsequent online visit. They offer a thorough list of the variables utilised in their study and in other articles, together with information on whether they were discovered to have a statistically significant impact.

### **PREDICTIVE ALGORITHMS IN ANTICIPATORY SHIPPING**

Predictive algorithms can be used in anticipatory shipping to help companies more accurately predict future demand for goods and optimize the timing and routing of shipments. These algorithms use data on past sales, customer behavior, and other relevant factors to create a model of future demand that can be used to make more informed decisions about when and where to send goods.

For example, a company might use a predictive algorithm to analyze data on past sales of a particular product in a particular location, along with data on weather patterns, local events, and other factors that might affect demand. The algorithm might then use this data to make predictions about future demand for the product in that location, which the company could use to plan its anticipatory shipping strategy.

Predictive algorithms can also be used to optimize the routing of shipments, by considering factors such as transport costs, lead times, and capacity constraints to determine the most efficient and cost-effective way to get goods to their destination. Overall, the use of predictive algorithms in anticipatory shipping can help companies more effectively meet customer demand and reduce costs associated with excess inventory and inefficient shipping routes.

### **FACTORS AFFECTING ANTICIPATORY SHIPPING**

There are several factors that can affect anticipatory shipping, which is a logistics strategy that involves sending goods to a location before they are actually needed in anticipation of future demand. These factors include:

Customer demand: Anticipatory shipping is used to meet anticipated customer demand, so changes in customer demand can significantly impact the effectiveness of this strategy.

- Lead time: The time it takes for goods to be shipped from the supplier to the customer is known as lead time. Long lead times can make it difficult to effectively implement anticipatory shipping, as it is harder to accurately predict future demand.
- Transport cost: The cost of shipping goods can impact the feasibility of anticipatory shipping. If transport costs are high, it may not be cost-effective to send goods to a location before they are needed.
- Storage cost: Anticipatory shipping often involves storing goods at a location until they are needed, so the cost of storing these goods can also affect the feasibility of this strategy.
- Seasonality: Many products experience seasonal demand, which can make it easier to predict when they will be needed and facilitate the use of anticipatory shipping.
- Competition: If a company's competitors are also using anticipatory shipping, this can impact the effectiveness of the strategy as it may lead to oversaturation of the market.
- Availability of data: Accurate data on past sales and customer demand can be helpful in predicting future demand and effectively implementing anticipatory shipping.

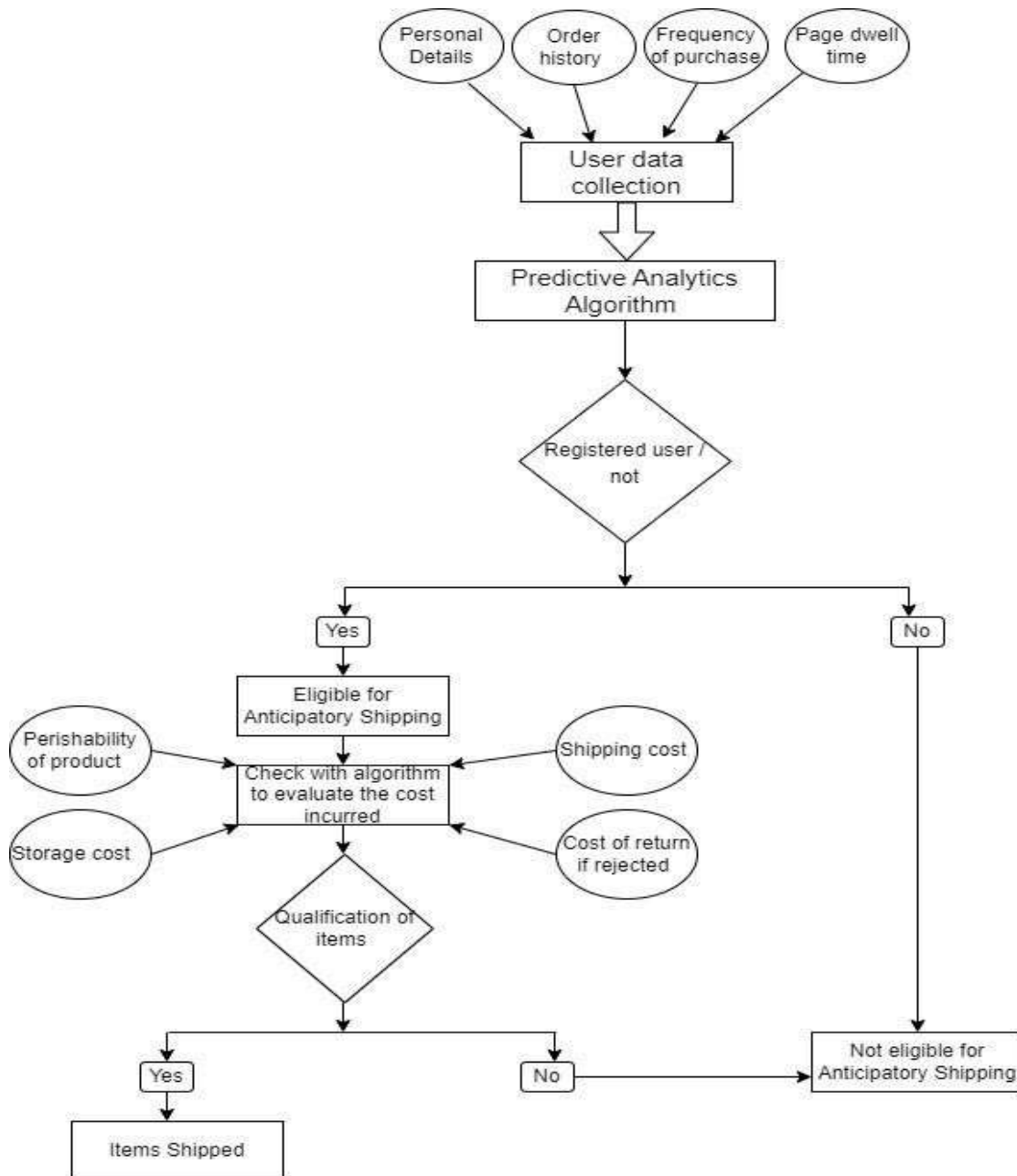
**Research findings on implementation of Anticipatory Shipping** Based on the research, here are a few key findings managers/companies must consider while implementing Anticipatory Shipping as their strategy for better service.

Product categories to be considered for Anticipatory Shipping: Anticipatory shipping is a logistics strategy that involves shipping products to locations in anticipation of future demand. This strategy can be effective for a wide range of products, including:

- Fast-moving consumer goods (FMCGs): FMCGs are products that are sold quickly and at a relatively low cost, such as food, beverages, and household products. These types of products are often suitable for anticipatory shipping, as they tend to have predictable demand patterns and can be easily stored and transported.
- Seasonal products: Anticipatory shipping can be particularly effective for seasonal products, such as holiday decorations or summer clothing. By shipping these products to key locations in advance of the season, a company can better meet demand and reduce the risk of stock-outs.

- High-demand products: Products that experience high levels of demand, such as electronics or popular toys, can also be suitable for anticipatory shipping. By shipping these products to key locations in advance of demand, a company can reduce the time it takes to fulfill orders and improve the customer experience.
- Expensive or fragile products: Shipping expensive or fragile products can be challenging, as they require careful handling and protection. Anticipatory shipping can help reduce the risk of damage or loss, as the products can be shipped to key locations in advance of demand and stored safely until they are needed

### Flowchart based algorithm for functionality of Anticipatory Shipping





## ADVANTAGES OF ANTICIPATORY SHIPPING

Anticipatory shipping is a logistics strategy in which a company ships products to a location before they are actually needed, in anticipation of future demand. This can have several advantages, including:

- Improved efficiency: Anticipatory shipping can help reduce the time and cost associated with fulfilling orders, as products are already in the distribution network when they are needed.
- Enhanced customer service: By reducing the time it takes to fulfill orders, anticipatory shipping can improve the customer experience and increase customer satisfaction.
- Increased agility: By having products already in the distribution network, a company can more quickly respond to changes in demand or shifts in market conditions.
- Greater control over the supply chain: Anticipatory shipping can help a company better control its supply chain, as it allows for better forecasting and planning.

Overall, anticipatory shipping can help companies increase efficiency, improve customer service, and better respond to changes in the market.

## CHALLENGES IN IMPLEMENTING ANTICIPATORY SHIPPING

There are several challenges that a company may face when implementing anticipatory shipping:

- Accurate forecasting: Accurate forecasting is key to successful anticipatory shipping, as it allows the company to anticipate future demand and ship products accordingly. However, forecasting can be difficult, as it involves predicting future demand for products, which can be influenced by a wide range of factors.
- Managing inventory: Anticipatory shipping involves holding inventory at different points in the distribution network, which can be expensive and increase the risk of excess or obsolete inventory.
- Coordination: Anticipatory shipping requires coordination between different parts of the supply chain, including suppliers, manufacturers, and logistics providers. This can be challenging, as it requires clear communication and collaboration between different stakeholders.
- Costs: Anticipatory shipping can be expensive, as it requires the company to hold additional inventory and potentially pay for additional transportation and storage costs.
- Flexibility: Anticipatory shipping may not be suitable for all products or market conditions, as it requires the company to anticipate future demand accurately. If demand changes unexpectedly, the company may be left with excess inventory that it cannot sell.

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